08/822778

PATENT

Date March 21, 1997

Docket No. 976149

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this New Application Transmittal and the documents referred to as enclosed therein are being deposited with the United States Postal Service on this 3/21/97 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EM576028546US addressed to: Box Patent Application, Commissioner of Patents and Trademarks, Washington, D.C. 20231.

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Box Patent Application
Commissioner of Patents and Trademarks
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Ronald S. Indeck

For : MAGNETIC WRITE HEAD WITH PRECONDITIONING GAP

Enclosed are:

1. Benefit of Prior U.S. Application (35 USC 120)

___ The new application being transmitted claims the benefit of a prior U.S. application and enclosed is added page for new application transmittal where benefit of a prior U.S. application claimed.

2. The Papers Required For Filing Under 37 CFR 1.53(b) or 1.60, as appropriate:

11 Pages of Specification
1 Pages of Abstract
4 Pages of Claims
3 Sheets of Drawing

___formal X informal

In addition to the above papers there is also attached
___ Pages of an Amendment.

3. Declaration or oath

_X_ Enclosed

_X_ original

executed by (check all applicable boxes)

_X_ inventor(s)

___ Not enclosed

4. Inventorship Statement

The inventorship for all the claims in this application are:

_X_ the same

OR

___ are not the same and an explanation, including the ownership of the various claims at the time the last claimed invention was made, is submitted.

5. Language

_X_ English ___Non-English

A verified English translation of the

[check applicable item(s)]

___ specification and claims

___ declaration

is attached.

6. Assignment

_X_ An assignment of the invention to Washington University

_X_ is filed under separate cover sheet

___ will follow

7. Certified Copy

Country) (Application No.) (Filed)

from which priority is claimed

___ is attached

___ will follow

8. Fee Calculation

CLAIMS AS FILED

Number Filed	Number Extra	Rate	Basic Fee $770
Total Claims 29 - 20 =	9	X $22.00	198
Independent Claims 5 - 3 =	2	X $80.00	160
	Multiple dependent Claim(s), if any		$260.00

___ Amendment cancelling extra claims enclosed

___ Amendment deleting multiple dependencies enclosed

___ Fee for extra claims is not being paid at this time

Filing Fee Calculation $ 1128.00

9. Small Entity Statement

_X_ verified statement that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is attached.

Filing Fee Calculation (50% of above) $ 564.00

10. Fee Payment Being Made At This Time

_X_ Enclosed

_X_ basic filing fee $ 564.00

Total fees enclosed $ 564.00

11. Method of Payment of Fees

_X_ check in the amount of $ 564.00

12. Authorization to Charge Additional Fees

_X_ The Commissioner is hereby authorized to charge the following additional fees which may be required to Account No. 18-1829;

_X_ 37 CFR 1.16 (filing fees and presentation of extra claims)

_X_ 37 CFR 1.17 (application processing fees)

___ 37 CFR 1.18 (issue fee at or before Mailing of Notice of Allowance, pursuant to 37 CFR 1.311(b).

13. Instructions As To Overpayment

_X_ credit Account No. 18-1829

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MAGNETIC WRITE HEAD WITH PRECONDITIONING GAP

Background and Summary

At present, most digital magnetic recording systems, such as those used for hard disk drives for personal computers, do not erase previously recorded data before recording new data. This is commonly known as recording in a direct overwrite mode. However, it has been found that writing in a direct overwrite mode increases the uncertainty of the exact location where a magnetic transition has been placed corresponding to the new data. This uncertainty reduces the system's signal-to-noise ratio (SNR) which has the practical limitation of reducing the system's effective storage capacity. As the bit lengths in digital recording become shorter from their already submicrometer dimensions, the ability of existing systems to write sharp transitions at particular locations lessens due to the previously written data encountered in the direct overwrite mode. As a result, signal degradation in the form of signal amplitude reduction, output pulse shape broadening, and pulse position shifts are experienced. This continuing progress in reducing the size of bit lengths and track

dimensions require even more accurate recording of sharp transitions to achieve digital data density resulting in improved performance. Therefore, erasing previously recorded magnetic information would be desirable in any digital magnetic recording system, but practical implementation of this erase operation remains elusive for many applications. For example, consider the tracks in rigid disk systems. These tracks are narrow, nearing the micrometer width, are separated by distances smaller than even the track width's micrometer dimension, and these track dimensions are rapidly shrinking with each new product iteration seeking greater data density. In these applications, erasing previously recorded data before writing with conventional magnetic recording heads might be thought of in a couple of ways. One such way is for the read/write head to erase the portion (sector) of the track to be recorded on one pass of the head, and then the next pass of the head would be used to record new digital data on the previously erased sector. An obvious drawback with this approach is that it would require a time consuming extra revolution for all write steps. This delay, presently 16 milliseconds for a 3600 rpm disk drive, is larger than any other single delay for the system and would degrade overall data transfer performance. Another approach could include providing a separate erase head physically positioned "upstream" of the conventional write head, and displaced in position as with other prior art video or audio erase heads. In analog audio or video tape recording, an erase step is used to precondition the medium by erasing the old information with a separate erase head. In these systems, the erase head is physically distinct and separated from the recording head spatially and in design. The erase head may be displaced from the record head by several centimeters; may erase multiple tracks of old information in the same pass; may have a large

magnetic gap for deep penetration of the magnetic field into the medium; and may use a single DC or AC applied current to erase the medium. However, there are problems in utilizing this approach with digital magnetic recording systems including the problem of physically aligning the two heads with respect to each other and with respect to the track to be overwritten. At present data densities and track dimensions, this is at least difficult and perhaps overwhelmingly challenging with track pitches projected to be 100 nanometers or less, especially considering that the heads must be consistently aligned over time, with temperature and other mechanical deviations providing further complications. Still another approach would include fabricating a second head to perform the erase function directly over the conventional write head. This approach could be considered in thin film heads which are widely used for digital magnetic recording systems. However, there would be significant cost and complexity added to the manufacturing process due to the additional steps involved with this approach.

To solve these and other problems in the prior art, the inventor has succeeded in developing a design for a thin film head with an integrated preconditioning gap which may be constructed with only a slight modification to the present manufacturing techniques utilized to construct thin film recording heads. It is anticipated that this modified construction may be achieved with only a small processing cost and without significantly reducing the expected yield of the delicate thin film manufacturing process. In essence, the inventors' design utilizes the same layering of a first magnetic pole piece, a pancake magnetic coil, and a second magnetic pole piece magnetically coupled to the first pole piece with one set of edges being spaced to form the magnetic gap therebetween. However, the bottom

or first pole piece would have an extended length so as to underlie the entirety of the pancake coil, and a third pole piece is provided which magnetically couples to the extended tail of the bottom or first pole piece to thereby encircle the back half windings of the pancake coil. The second gap or preconditioning gap is thereby formed between this additional third pole piece and the second pole piece.

In sum, using conventional thin film manufacturing techniques and present designs, a thin film magnetic recording head may be conveniently manufactured with an intricately formed preconditioning gap to provide an on-the-fly erase function. This device has applicability to both perpendicular and longitudinal recording. Due to its being manufactured in an integral, single head, the preconditioning gap is always aligned and suffers the same environmentally induced degradation such as through temperature, stress, or the like such that it remains so. Furthermore, there is no intervening spacing between the preconditioning gap and the write head as the center pole piece forms part of the magnetic circuit for each of these two gaps. Therefore, once manufactured, the preconditioning gap is aligned, its performance may be measured and tested to verify its operating parameters, and could be expected to remain in that condition over time and through its useful life. As the center pole piece is energized by a single coil, and the center pole piece forms part of the magnetic circuit for both gaps, there is no requirement for a second magnetic coil. This reduces cost, manufacturing complexity, eliminates alignment problems, and contributes to the invention's elegantly simple design. Furthermore, there is no need for a separate "erase" signal as the write signal which energizes the coil is used.

This same concept may also be implemented in a ring head coil construction with a center pole comprising

an I-pole piece having a coil wrapped therearound and two C-pole pieces surrounding the I-pole piece.

While the principal advantages and features of the present invention have been explained, a fuller understanding of the invention may be gained by referring to the drawings and description of the preferred embodiment.

Brief Description of the Drawings

Figure 1 is a schematic representation of a conventional inductive write head as known in the art,

Figures 2(a) to (d) are perspectives detailing the construction of a thin film inductive head or write head manufactured through layering processes as known in the art,

Figures 3(a)-(d) are perspective views detailing the construction of the thin film inductive head of the present invention,

Figure 4 is a schematic representation of the prior art construction of a ring head coil detailing the use of two C pole pieces,

Figure 5 is a schematic representation of a prior art ring head coil utilizing a C and I pole piece, and

Figure 6 is a schematic representation of a ring head coil arrangement illustrating a write head with preconditioning gap of the present invention.

Description of the Preferred Embodiment

As shown in Fig. 1, it is well known in the prior art that a conventional inductive write head 20 is formed with a head core 22 made of magnetic material and formed in the general shape of a C with a gap 24 wherein a gap fringing field 26 is formed through energization of a coil 28 energized from a current source 30, all as is well known in the art. Also, a side fringing field 32 is formed along the side edges of gap 24. The magnetic flux in the gap fringing field 26 is emitted during writing, or erasing, as coil 28 is energized to magnetize a

magnetic medium (not shown) which passes across the face 34 of head core 22 and adjacent gap 24. The conventional head structure depicted in Fig. 1 has been dramatically improved on and miniaturized over the years since its discovery to present day techniques which include a new method of fabrication known as thin film.

Thin film head construction is depicted in Figs. 2(a)-(d). In this method of construction, a substrate 36 forms a base over which a first pole piece P_1 (38) comprised of a thin film of magnetic material is laid. Over pole piece P_1, a thin pancake coil 40 is laid wound in a spiral with its leads 42, 44 for electrical connection to an appropriate current source (not shown). As shown in Fig. 2(c), a second pole piece P_2 (46) overlies one side of the windings comprising coil 40 with a connector 48 attaching pole piece P_2 to pole piece P_1 in an appropriate mechanical orientation to form gap 50 therebetween at the tips 52, 54 of pole pieces P_1, P_2, respectively. A lead connector 56 is also applied to provide a convenient means for connecting the interior coil lead 44 to an external current source (not shown). As shown in Fig. 2(d), the windings of coil 40 surround pole piece P_2 to induce a magnetic flux in the gap 50 formed between pole tips 52, 54.

The present invention builds on the prior art construction of thin film magnetic heads and is depicted in Figs. 3(a)-(d). As shown in Fig. 3(a), a pole piece P_1 (100) is provided which extends for a greater distance along substrate 36 so as to underlie coil 102 and extend beyond the outer edges of its back winding. This is depicted in Fig. 3(b) with coil 102 covering substantially the entirety of pole piece P_1 (100). As shown in Figs. 3(c) and (d), pole piece P_2 (104), similar to the prior art construction shown in Fig. 2, overlies the front of coil 102 and is connected to pole piece P_1 (100) at the center of the coil 102. However, a third

pole piece, P_3 (106) overlies pole piece P_2 (104) and the back half of coil 102 where it is magnetically coupled to pole piece P_1 at its rear most end 108. As perhaps is best shown in Fig. 3(d), coil 102 thereby surrounds pole piece P_2 (104), similar to the prior art construction shown in Fig. 2, however, a second magnetic circuit is formed between pole piece P_2 (104), the back half of pole piece P_1 (100) which is joined at junction 108 to pole piece P_3 (106) to thereby form a preconditioning gap 110 between the tip 112 of pole piece P_2 (104) and the tip 114 of pole piece P_3 (106). This second, preconditioning gap 110, is in addition to the write gap 116 formed between the tip 112 of pole piece P_2 (104) and the tip 118 of pole piece P_1 (100).

In the present invention, the preconditioning gap 110 serves to "precondition" or magnetize into a known state, the magnetic medium prior to its presentation to the write gap 116. As this magnetization is induced by the preconditioning gap 110 is well known, and is directly related to the write field as it is being driven by the same write current, much more precise placement of the transition onto the medium may be achieved. This will provide a significant improvement in the SNR and accommodate an increase in the system capacity by increasing data density. Although the dimensions for write gap 116 and preconditioning gap 110 may be selected as desired to accommodate any particular application, the inventor contemplates that a write gap of between about .15 and about .25 microns is presently considered typical, and these dimensions are decreasing as development continues such that a write gap of .10 microns is expected soon. Similarly, the preconditioning gap 110 width may be chosen as desired but the inventor contemplates that a width of approximately .5 microns or less will provide the preconditioning effect as desired for preconditioning the magnetic medium. Similarly, the

pole tip width of each pole piece may be chosen to provide appropriately sized erase and write tracks, depending upon the particular application. One such configuration might include a preselected pole tip width for P_1, a wider pole tip width for P_2, and a pole tip width of P_3 the same as that of P_1. This arrangement would provide a larger erase track width to overcome the potential problem of not completely erasing old information due to improper head alignment. Although, it would not be uncommon for the pole tip widths to be equal to provide erase and write track widths of comparable width. As is known in the art, the pole tips may be sized by planar lithography, pole tip trimming, or some other equivalent method.

In operation, a magnetic medium (not shown) would traverse the head construction of the present invention as depicted in Fig. 3(d) from right to left such that it would first be subjected to the magnetic field induced by preconditioning gap 110 to precondition it. As that portion of the magnetic medium passes under write gap 116, its induced magnetization is known as it has been preconditioned or magnetically "written to" by preconditioning gap 110. Although, as mentioned above, the gap size for preconditioning gap 110 may be chosen as desired, it is presently thought that A-C erasure is more desired. Hence, a wider preconditioning gap 110 with a higher frequency data write signal will provide a decaying alternating field that will set the state of magnetization on the magnetic medium closer to that expected to be achieved with true A-C erasure. This is due in part to a wider gap not being as effective in creating a sharp transition. However, this is just one example of a particular construction which may be utilized, depending upon the particular application chosen.

There may also be manufacturing considerations which would impact on the choice of individual pole piece construction or gap sizing. For example, as depicted in Fig. 3(d) and explained herein, pole piece P_1 (100) has been chosen to extend under the full width of coil 102, with pole piece P_2 (104) attached near its center or medial portion, and pole piece P_3 (106) attached near its end opposite the tip end. However, other alternative construction could be used and still satisfy the magnetic requirements of the head of the present invention. For example, pole piece P_2 may be chosen to include the extension underlying the back half of coil 102. Or, P_3 (106) may also be chosen to include that portion of a pole piece which underlies the back half of coil 102. Similarly, other configurations may be utilized to satisfy the coil requirements for the head of the present invention. For example, a separate or additional coil may be utilized which might, for example, surround pole piece P_3 to provide a different preconditioning signal than the write signal.

As shown in Figure 4, the construction of a prior art ring head coil 140 may include a pair of C-shaped pole pieces 142, 144 joined by suitable means as known in the art at one end thereof, as shown at 146. One or more coils 148, 150 may be wrapped around the C-shaped pole pieces 142, 144 in order to energize a write or read gap 152 between the opposite ends 154, 156 of C-shaped pole pieces 142, 144. An alternative construction for a ring head coil 158 includes a C-shaped pole piece 160 and an I-shaped pole piece 162 joined at an end thereof as at 164 with a coil 166 wrapped around the I-shaped pole piece 162. In this construction, a read or write gap 168 is formed between the opposite ends 170, 172 of the two pole pieces 160, 162. This construction might be in some circumstances easier to manufacture as the coil 166 may be readily wrapped around the I-shaped pole piece 162

prior to its being joined as at joint 164 using convenient manufacturing methods, as known in the art.

The present invention may be implemented in the ring head coil 174 in a construction as depicted in Figure 6. In that construction, a center I-shaped pole piece 176 having a coil 178 wrapped therearound is surrounded on either side by a C-shaped pole piece 180, and a C-shaped pole piece 182, both of which are joined at an end to the I-shaped pole piece 166 at joints 184, 186. A write gap g_1 is formed between the ends 188 of C-shaped pole piece 180 and end 190 of I-shaped pole piece 176. A preconditioning gap g_2 is formed between the end 192 of C-shaped pole piece 182 and end 190 of I-shaped pole piece 176. In ring coils, write gaps may be somewhat larger than those in presently manufactured thin film heads. For example, write head gap g_1 may be of a size of approximately .2 microns up to .5 microns, and even larger depending upon the particular application such as for video tape, etc. For purposes of the present invention, it is only important that the width of preconditioning gap g_2 be chosen as is sufficient to precondition the magnetic medium prior to its being written on with write gap g_1. In the preferred embodiment, the inventor contemplates that the preconditioning gap g_2 is larger than the write gap g_1.

Still another aspect of the present invention is the improvement in the head field gradient, and the ability of the manufacturer to alter and adjust the head field gradient by adjusting the gap widths. As shown by the inventors' prior work, the head field gradient may be sharpened to facilitate the writing of sharp transitions on a magnetic medium by locating a shim in an existing write gap. However, until the present invention, a physical embodiment or construction to implement a shim placement has not been known. With the present invention, an integral construction is provided which

lends itself readily to location of the center pole piece and its use as part of both the write gap and preconditioning gap for achieving an improved or sharpened head field gradient. This sharpened head field gradient also renders the head more suitable for perpendicular recording for which sharp transitions are especially important.

Still other variations in construction may be considered and implemented by those skilled in the art in order to facilitate manufacture, or for other reasons, and yet not depart from the spirit and scope of the invention. The present invention shall not be considered to be limited to the construction of the preferred embodiment as has been previously described and instead should be limited only by the scope of the claims appended hereto, and their equivalents.

What is claimed is

1. A thin film magnetic recording head with an integrally formed, magnetically energized, preconditioning gap.

2. The thin film magnetic recording head of claim 1 wherein said head comprises a write gap aligned with said preconditioning gap.

3. The thin film magnetic recording head of claim 2 wherein said preconditioning gap is wider than said write gap.

4. The thin film magnetic recording head of claim 3 wherein each of said gaps comprise a pair of pole pieces surrounding a thin film head coil.

5. The thin film magnetic recording head of claim 4 wherein said gaps share a common pole piece, said head thereby having three pole pieces to form said two gaps.

6. The thin film magnetic recording head of claim 4 wherein said pairs of pole pieces surround a portion of the same thin film head coil, said head thereby having a single thin film head coil to energize both of said gaps.

7. The thin film magnetic recording head of claim 5 wherein said pole pieces comprise a first pole piece P_1, a second pole piece P_2 having said coil wrapped therearound and having an end thereof magnetically coupled to P_1, and a third pole piece P_3 having an end thereof magnetically coupled to P_2.

8. The thin film magnetic recording head of claim 7 wherein P_3 is magnetically coupled to P_2 through a portion of P_1.

9. The thin film magnetic recording head of claim 7 wherein the write gap is between about .10 microns and about .25 microns in width and the preconditioning gap is wider than the write gap.

10. The thin film magnetic recording head of claim 9 wherein the preconditioning gap is approximately .5 micron in width.

11. A thin film magnetic recording head having a pair of gaps, one of said gaps being a write gap, said gaps being formed between three pole pieces, the center pole piece having a single thin film coil wrapped therearound and said center pole piece forming part of the magnetic circuit for each of said gaps.

12. The thin film magnetic recording head of claim 11 wherein the other of said gaps is a preconditioning gap, said preconditioning gap being wider than said write gap.

13. The thin film magnetic recording head of claim 12 wherein said gaps are formed between a pole tip of each of said pole pieces, said pole tips having a pre-selected width, as desired.

14. The thin film magnetic recording head of claim 12 wherein said pole pieces are aligned, and overlie each other and the coil in an integrated thin film structure.

15. The thin film magnetic recording head of claim 14 wherein said structure includes a first pole piece P_1, a substantially helically wound pancake coil overlying P_1, a second pole piece P_2 overlying a portion of said coil and magnetically coupled to P_1 at a medial position thereof through a center of said coil, and a third pole piece P_3 overlying P_2 and magnetically coupled to an end thereof.

16. The thin film magnetic recording head of claim 15 wherein P_3 is magnetically coupled to P_2 through a portion of P_1.

17. The thin film magnetic recording head of claim 15 wherein P_3 is magnetically coupled to P_1 at an end thereof to substantially surround P_2 and the coil between them.

18. A magnetic recording head with an integrally formed, magnetically energized, preconditioning gap.

19. The magnetic recording head of claim 18 wherein said head comprises a write gap aligned with said preconditioning gap.

20. The magnetic recording head of claim 19 wherein said preconditioning gap is wider than said write gap.

21. The magnetic recording head of claim 20 wherein each of said gaps comprise a pair of pole pieces, with one of each pair of said pole pieces being magnetically energized.

22. The magnetic recording head of claim 21 wherein said gaps share a common pole piece, said head thereby having three pole pieces to form said two gaps.

23. The magnetic recording head of claim 20 wherein said pairs of pole pieces surround a portion of a single coil, said single coil thereby energizing both of said gaps.

24. The magnetic recording head of claim 22 wherein said pole pieces comprise a first pole piece, a second pole piece having a single coil wrapped therearound and having an end thereof magnetically coupled to the first pole piece, and a third pole piece having an end thereof magnetically coupled to the second pole piece.

25. The magnetic recording head of claim 24 wherein said head is a ring head.

26. A magnetic recording head having a write gap and an adjacent gap whose magnetic flux interacts with the write gap flux to produce an increased magnetic write field gradient.

27. The magnetic recording head of claim 26 further comprising a coil for magnetically energizing the adjacent gap.

28. The magnetic recording head of claim 26 wherein the same coil energizes both the write gap and the adjacent gap.

29. A magnetic recording head with an integrally formed preconditioning gap adjacent a write gap.

ABSTRACT OF THE DISCLOSURE

A thin film magnetic head includes an integrally formed preconditioning gap having a width greater than the write gap width to precondition a magnetic media for the more accurate placement of magnetic transitions on a magnetic medium. The thin film magnetic head is comprised of a first extended pole piece underlying a thin pancake helically wound magnetic coil with a second pole piece aligned with the first pole piece and attached to it through the center of the coil. A third pole piece, aligned with the first two pole pieces, overlies all of the foregoing and is attached to the first pole piece at its rearward end to thereby cover the other underlying layers of this thin film structure. The single magnetic coil surrounds the second pole piece and energizes both gaps.

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(1)

Figures: Asher

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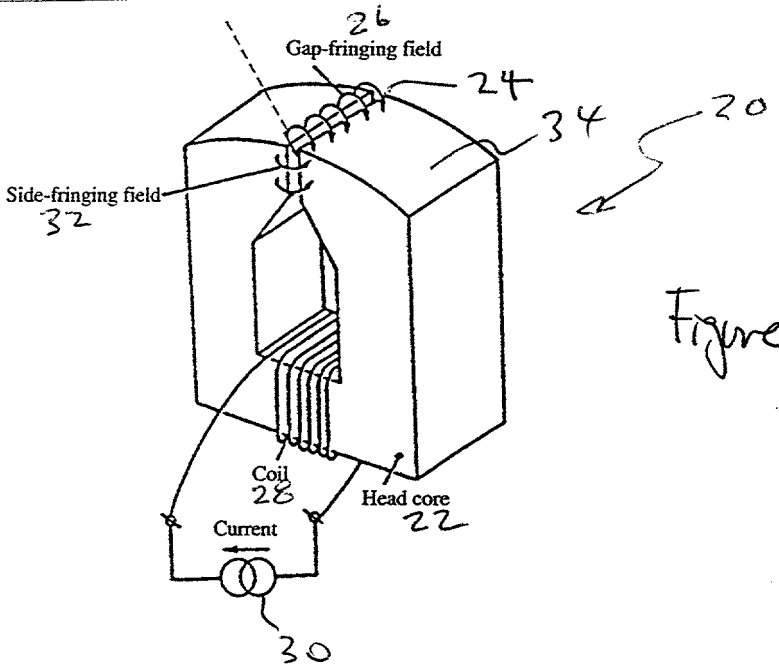


Figure 1. Ring head Schematic
PRIOR ART

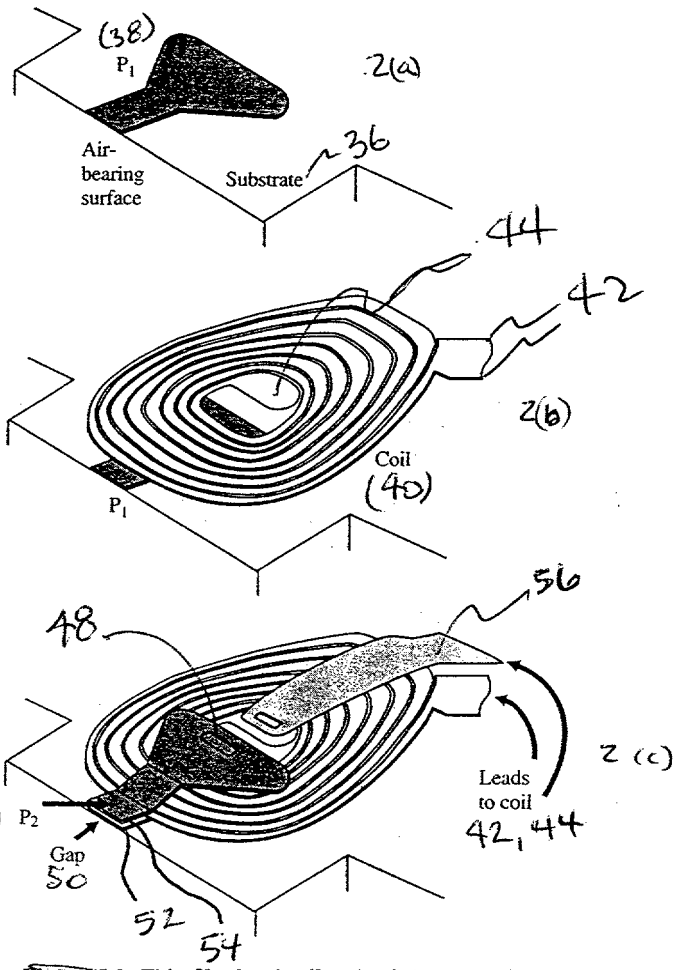
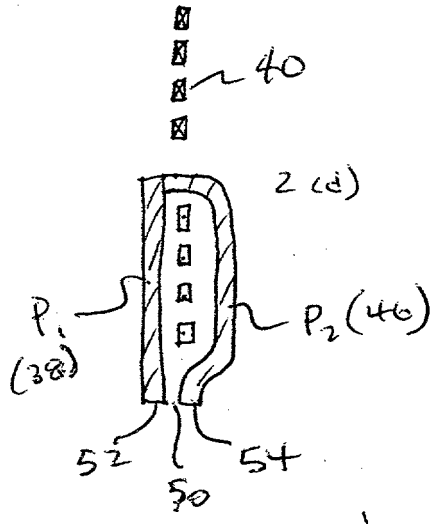


Figure 2. Thin film Head Schematic
PRIOR ART

~~Figure 5.2~~ Thin film head coil and yoke construction.



Center cut side view

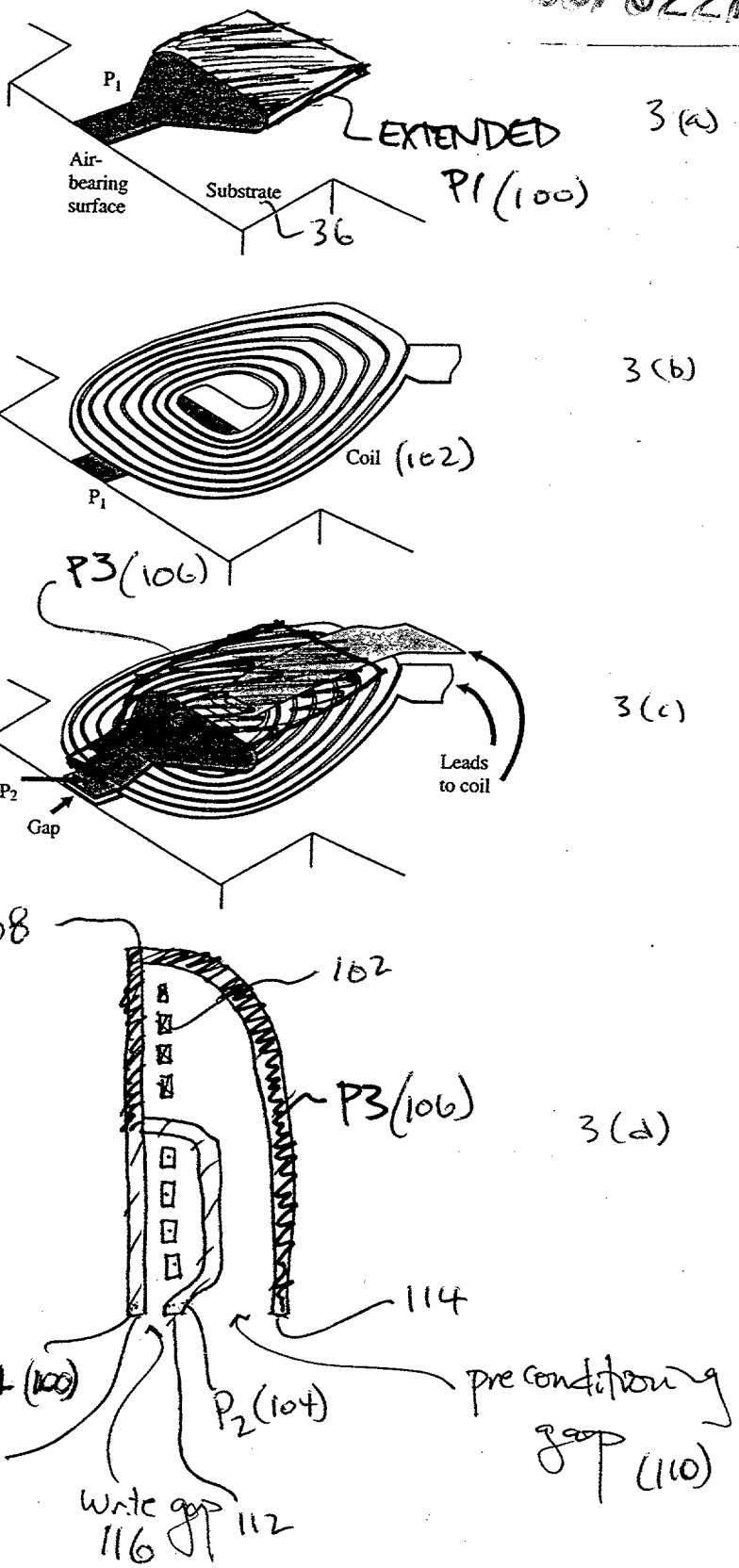


Figure 3. Novel head structure

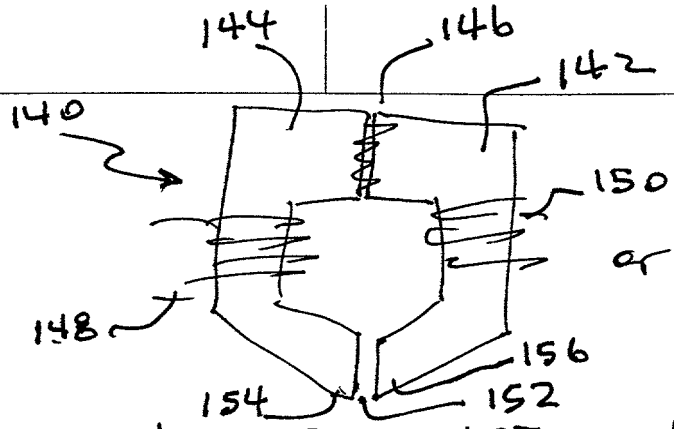


Fig. 4 PRIOR ART
C.C

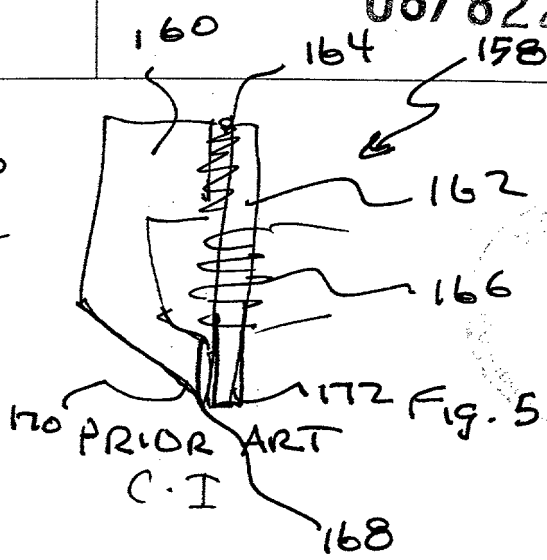


Fig. 5 PRIOR ART
C.I

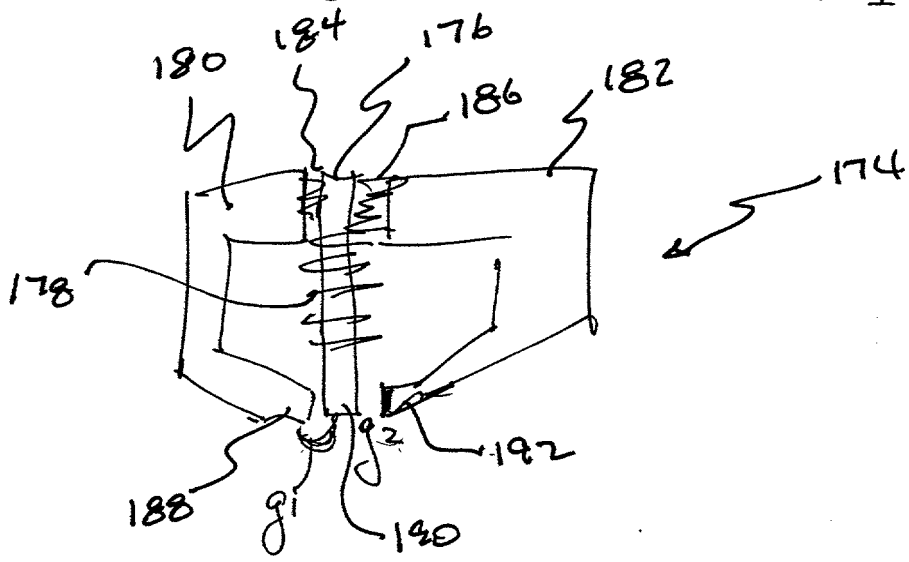


Fig. 6

Inductive ring head

Express Mail #EM576028546US

PATENT

Applicant or Patentee: Ronald S. Indeck
Serial or Patent No.:
Attorney's Docket No.: 976149
Filed or Issued:
For: MAGNETIC WRITE HEAD WITH PRECONDITIONING GAP

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS [37 CFR 1.9(f) and 1.27(b)]
INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled MAGNETIC WRITE HEAD WITH PRECONDITIONING GAP
described in:

_X_ the specification filed herewith.
___ Application Serial No. ______________, filed ____________
___ Patent No. ____________, issued ____________

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

___ no such person, concern, or organization
_X_ persons, concerns, or organizations listed below.

FULL NAME Washington University
ADDRESS One Brookings Drive
St. Louis, Missouri 63130

___ INDIVIDUAL ___ SMALL BUSINESS CONCERN _X_ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. [37 CFR 1.28(b)].

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Ronald S. Indeck		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
Ronald S Indeck		
Signature	Signature	Signature
MR 21, 1997		
Date	Date	Date

76205

PATENT

Attorney's Docket No. 976149

COMBINED DECLARATION AND POWER OF ATTORNEY

(Original, Design, National Stage of PCT or CIP Application)

Inventors: Ronald S. Indeck

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed above) or an original, first and joint inventor along with those listed above (if plural names are listed above) of the subject matter which is claimed and for which a patent is sought on the invention entitled: MAGNETIC WRITE HEAD WITH PRECONDITIONING GAP

the specification of which: (Complete (a), (b) or (c) for type of application)

REGULAR OR DESIGN APPLICATION

(a) _X_ is attached hereto.

(b) ___ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

(c) ___ was described and claimed in International Application No. _____ filed on _____ and as amended on _____ (if any).

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

___ In compliance with this duty there is attached an information disclosure statement. 37 CFR 1.97.

PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

[Complete (d) or (e)]

(d) _X_ no such applications have been filed.

(e) ___ such applications have been filed as follows.

EARLIEST FOREIGN APPLICATION(S), IF ANY FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION

Country	Application No.	Date of filing (day, month, year)	Date of issue (day, month, year)	Priority Claimed
				___YES NO ___
				___ YES NO ___

ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION

CONTINUATION-IN-PART

(Complete this part only if this is a continuation-in-part application)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.)	(Filing Date)	(Status)	(Patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status)	(Patented, pending, abandoned)

POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorney and/or agent to prosecute this application and transact all business in the U.S. Patent and Trademark Office connected therewith, before all competent international authorities in connection with any international application, and before all foreign patent offices in connection with the national phase of any international application or any foreign application, and to appoint any associate attorneys in connection with any application, either domestic, international or foreign national.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Ronald S. Indeck

Inventor's signature Ronald S Indeck

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